Lecture Module - Introduction

ME3023 - Measurements in Mechanical Systems

Mechanical Engineering

Tennessee Technological University

Topic 1 - General Measurement System

Topic 1 - General Measurement System

- Welcome Back!
- Definition of a Measurement
- Measurement System Stages
- Brainstorming Activity
- Examples in Mechcanical Engineering

Welcome Back!

Notes about class:

- These lecture notes can be found on ilearn under Content > Lecture Modules.
- The material will be organized in 10 to 15 min lectures. You are encouraged to ask questions.
- The lectures and most discussions will be recorded. You can watch them anytime.
- Lectures will be followed by a class activity to be submitted by the end of the class session.

Definition of a Measurement

"A **measurement** is an act of assigning a specific value to a physical variable."

Text: Theory and Design of Mech. Meas.

Measurement System Stages

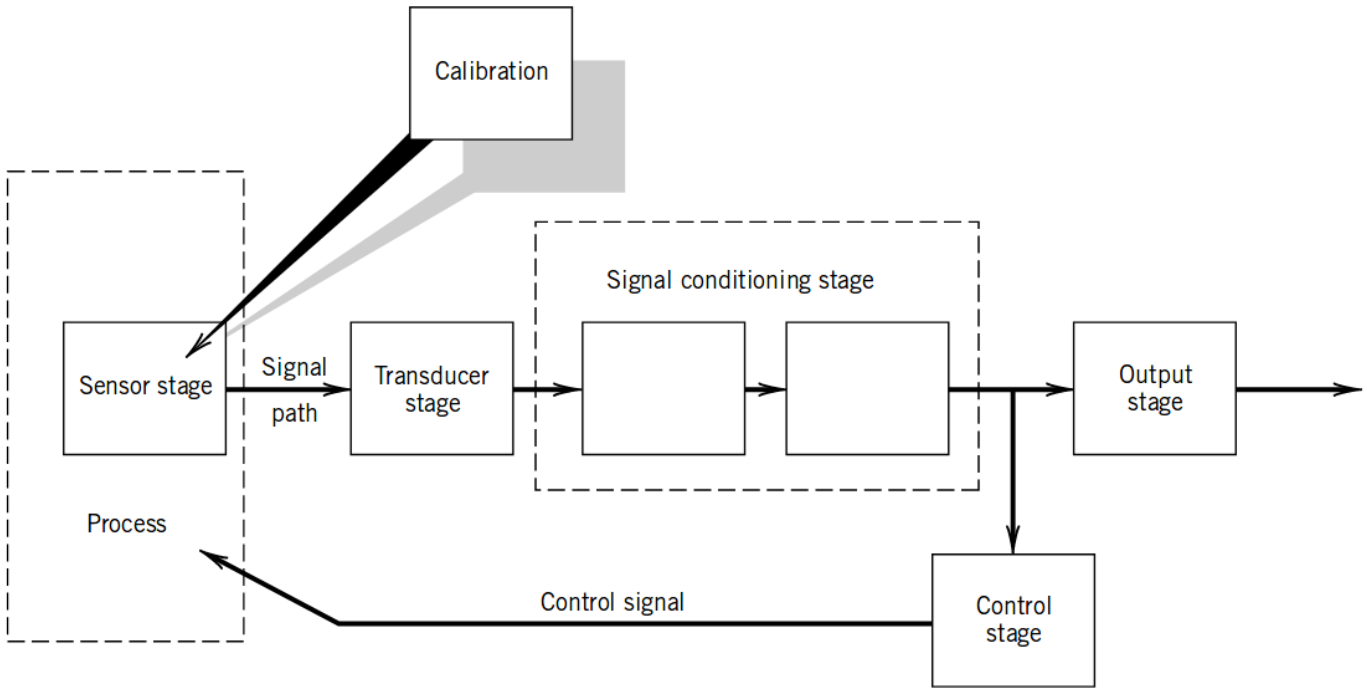
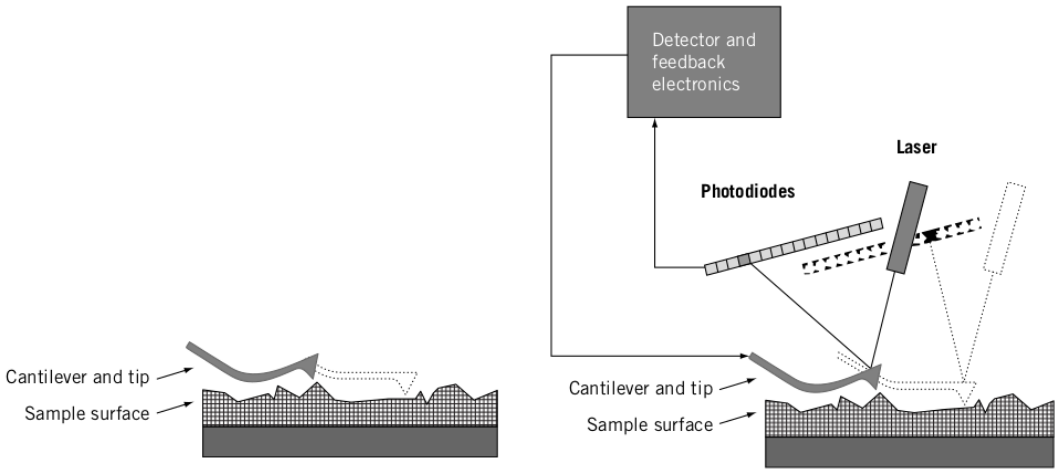


Figure 1.5 Components of a general measurement system.

Image: Theory and Design of Mech. Meas.

Sensor-Transducer Stage

a sensor, a physical element that employs some natural phenomenon... ...to sense the variable being measured

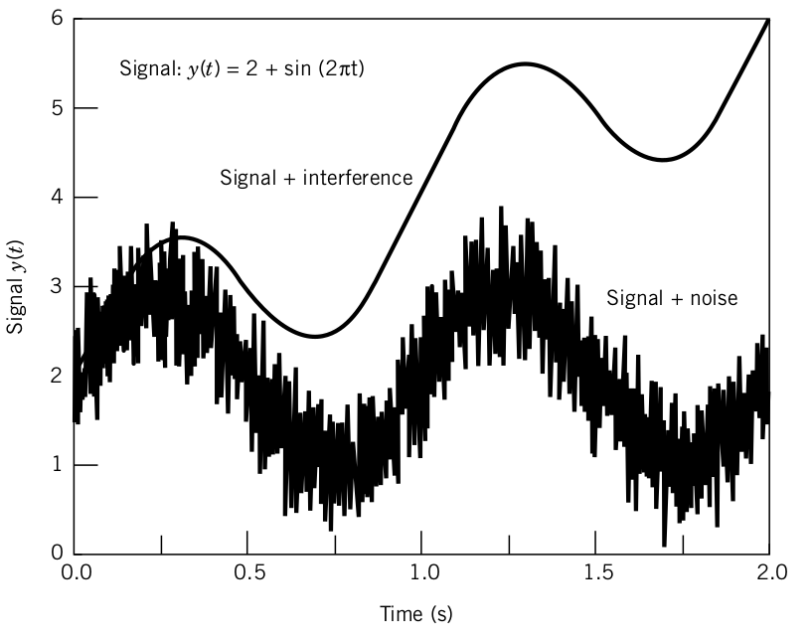


A transducer converts the sensed information into a detectable signal

Text, Image: Theory and Design of Mech. Meas.

Signal Conditioning Stage

What is the the definition of signal?



- Filtering
- Amplification
- Attenuation
- Excitation
- Linearization
- Electrical Isolation
- Surge Protection

Image: Theory and Design of Mech. Meas.

Output Stage

The output stage indicates or records the value measured. This might be a simple readout display, a marked scale, or even a recording device such as a computer disk drive.

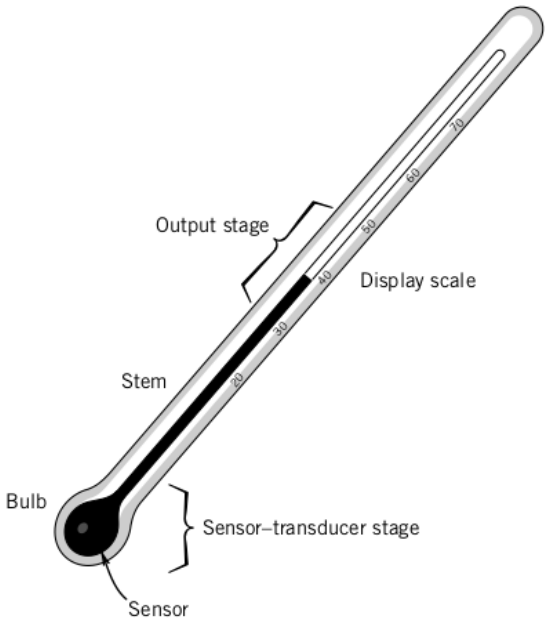


Image: Theory and Design of Mech. Meas.

Image: Wikipedia

Brainstorming Activity

Activity: Team Brainstorm
Duration: $\sim$ 10 minutes
Groups: 2-3 members

Topic: Remote Probe Concept

- You are designing a remote probe to inspect an environment which can only be accessed from above.
- The goal is to collect as much information as possible from the environment to prepare for a robotic maintinence task.

Requirements:

- Probe must enter environment through hole $\sim 100mm$ wide
- Probe must exit through same hole leaving nothing behind
- The alllowable EFI and RFI is limited. No wifi communication is available

Deliverable: Submit a copy of your team brainstorming notes including text, images, and diagrams to the activity assignment on ilearn. Include names of all team members.

Examples in Mechcanical Engineering

IDETC2022-96785: Development of an Instrumented Rear Suspension to Measure the Tire Forces of a Race Car During Track Driving

Examples in Mechcanical Engineering

IDETC2022-91154: Photometric Stereo Enhanced Light Sectioning Measurement for Microtexture Road Profiling

Examples in Mechcanical Engineering

IDETC2022-90082: Automated Weld Path Generation Using Random Sample Consensus and Iterative Closest Point Workpiece Localization